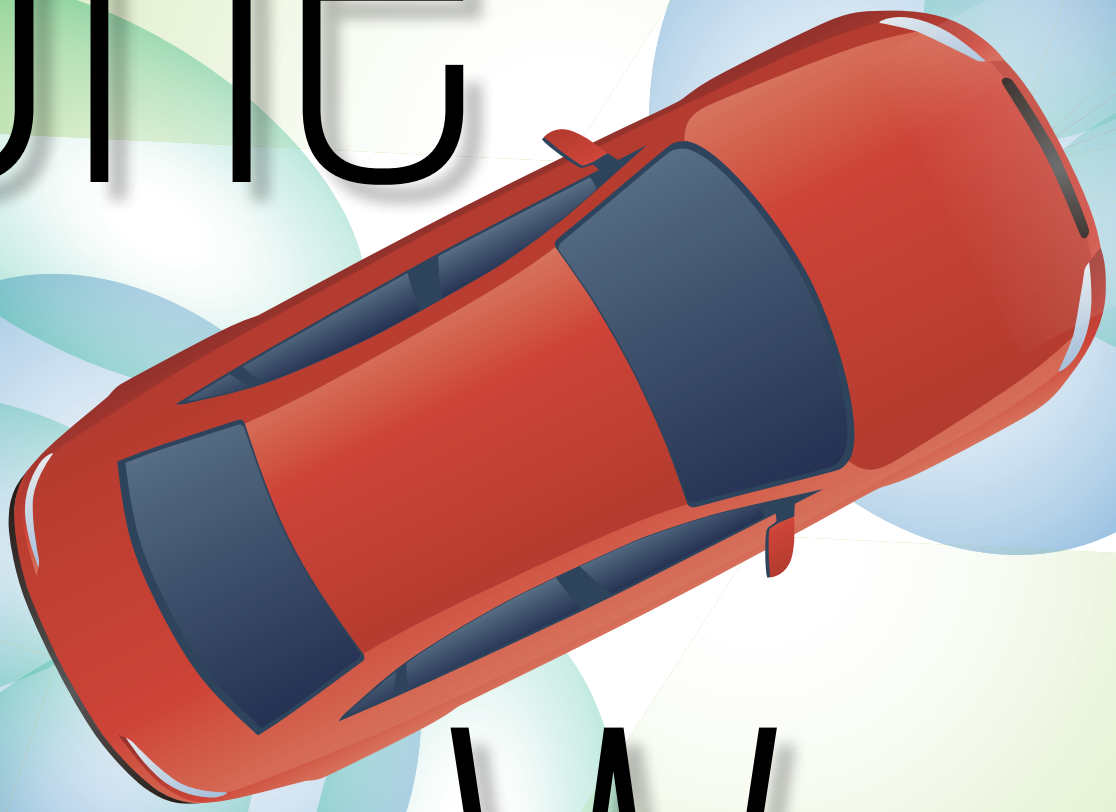
One Way



How Improved Vehicle Tech Is Changing the Casualty Market

By Thomas Gage and Richard Bishop

THE $200+ BILLION U.S. vehicle insurance industry is in the early stages of an accelerating decline. Why? Because Advanced Collision Avoidance (ACA) technology is making driving much safer.

For insurers, the timing isn't this quarter's challenge, but significant effects will begin to be felt much sooner than many executives expect. And the magnitude of the impact calls for action now. In this piece, we offer several steps that can be taken to improve performance during this tumultuous transition for the casualty insurance market.

Clarifying Driver Assistance and Automation

Vehicle technology is at a dramatic inflection point. Much of the recent press has been about vehicle automation—specifically full automation, where you sit back and watch a movie in the front seat. A vehicle that does the driving for you seems so far from today's experience that many believe a leap to such technology must certainly be in the very distant future.

While it's true that broadly available, consumer-ready, fully automated vehicles are at least a decade away, an increasing number of vehicles on the market and on the streets already employ advanced collision avoidance (ACA) systems, also known as active safety systems. These are the vehicles that are reducing crashes, reducing risk, and soon will be reducing premiums.

In other words, the advent of crash reductions due to vehicle intelligence occurred *yesterday*.

If you've seen or driven in a late-model vehicle with a safety system called Forward Collision Avoidance (FCA), you've seen a vehicle with an ACA system. ACA systems are "always on" systems that monitor road conditions with a variety of sensors and assist the driver in potentially dangerous situations by assuming control of key functions to avoid accidents. You are still driving, but the car is prepared to apply brakes at partial or full power if you don't see the vehicle stopping in front of you, or steer you back into the lane if you are drifting.

Think of these types of systems as "temporary co-pilots." They make you a safer driver and help you avoid accidents, but they don't drive the car for you. Most importantly, it is these

FIGURE 1

Summary of Crash Avoidance Technology and Automation Levels

The largest effects on crash reduction will occur at Level 1, ACA Levels 2-4 will provide more automation and more convenience

Technology	NHTSA Automation Level	System Status	Technology Function	Driver Attention Required		
Crash Avoidance **(CA)**	**Level 0:** Non-automation	Always on*	Warning	Brain on	Eyes on	Hands on
Advanced Crash Avoidance **(ACA)**	**Level 1:** Function-Specific Automation	Always on*	Brief Emergency Control	Brain on	Eyes on	Hands on
Semi-Automated Vehicles **(SAV)**	**Level 2:** Combined Function Automation	Driver activated	Monitored Automation	Brain on	Eyes on	Hands off
Semi-Automated Vehicles **(SAV)**	**Level 3:** Limited Self-Driving Automation	Driver activated	Highly Automated Driving	Brain on	Eyes off	Hands off
Automated Vehicles **(AV)**	**Level 4:** Full Self-Driving Automation	Driver activated or always on*	Full Auto-pilot	Brain off	Eyes off	Hands off

*Drivers have the option of manual or "always on" at the time of turning on the vehicle and at other times.

Source: National Highway Traffic Safety Administration (U.S. Department of Transportation). Marconi Pacific clarification and additions.

systems—not semi-automated or fully automated vehicles—that will begin to significantly reduce accidents through computer control. The ultimate goal for these systems is to intervene momentarily in crisis situations to completely avoid accidents. Many current systems can do this now up to a certain speed, and in some vehicles emergency braking can intervene at any speed.

But even if a system is not successful at avoiding a collision outright, the system can reduce a vehicle's speed and turn a more severe accident into a lesser one—across the full range of highway speeds. This is simple physics: The kinetic energy of a vehicle impact increases exponentially as velocity increases. So if an FCA system slows a car from 75 mph to 50 mph before impacting an object, the amount of kinetic energy at impact is decreased by more than half. If the technology can slow the vehicle to 25 mph, the impact force is reduced 90 percent. As the technology is offered and purchased on an increasing number of new vehicles and diffuses through the vehicle fleet, many of the most common accidents will be made less severe, or avoided outright, by computer-enabled intervention in the driving task during crisis situations.

Advanced Collision Avoidance—An Example

A lot of data already available on ACA technology prove its effectiveness.

Volvo's "City Safety" automatic braking system has been standard equipment on the XC60 since 2010 and the S60 since 2011. This system uses a laser sensor to detect objects up to 500 feet in front of the vehicle and will pre-charge and activate the brakes if necessary to prevent or mitigate a forward collision.[1] The system is able to completely avoid collisions without driver intervention at speeds up to 30 mph and significantly decrease the severity of collisions at any speed greater than 30 mph.

Data indicate that City Safety is delivering on its name. Volvo estimates that 75 percent of all reported collisions occur at speeds of 19 mph or below, well within the capability of City Safety.[2] More important, the Highway Loss Data Institute (HLDI) has analyzed claims data for City Safety-equipped Volvos and found significant reductions in frequency and severity across all claim types. HLDI's statistical analysis suggests that "if all vehicles were equipped with a system like City Safety, more than one-sixth of all physical damage claims and more than one-fifth of all injury claims would be eliminated."[3] This one collision avoidance system is already significantly reducing claims based on real-world data, and other automakers now offer similar systems. Low-speed automatic braking represents only a single example of the array of collision avoidance systems on the market today.

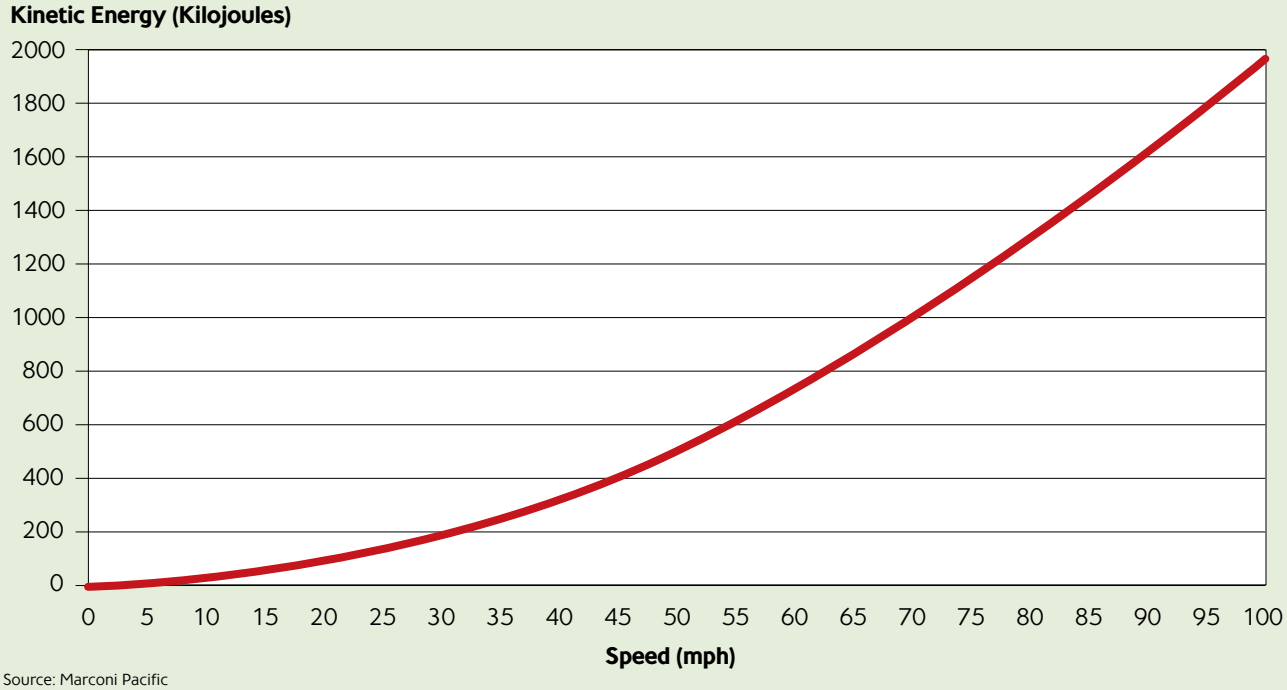
A more comprehensive modeling study, performed by the Insurance Institute for Highway Safety (IIHS) based mostly on 2009 available ACA systems, looked at the various types of vehicle accidents that occur in a given year and asked how ACA systems might address each type. The findings suggested that three main ACA technologies—forward collision warning/mitigation, side view assist, and lane departure warning/prevention—could reduce all crashes by 30 percent if implemented in all vehicles.[4]

It has taken time for these studies on early ACA systems to accumulate enough data to deliver conclusions about ACA effectiveness. But now the data are clear. Most importantly, systems currently in dealer showrooms or systems that will be available in the near future far surpass the capabilities in these early systems studied. The impact of these technologies will provide even greater collision avoidance benefits.

FIGURE 2

Kinetic Energy Effect of Increasing Speed

The kinetic energy generated by a 4,000 lb. vehicle. Decreasing speed by even a small amount in a high-speed crash dramatically decreases the kinetic energy of the impact.



Source: Marconi Pacific

FIGURE 3

Vehicle Technology Evolution Path

CRASH AVOIDANCE

Crash Avoidance (CA) warns the driver of an impending crash

Advanced Crash Avoidance (ACA) intervenes to control the vehicle for a short duration to avoid an impending crash

AUTOMATION

Initially some roads and some driving environments

Evolving to all roads and all driving environments

Driver role evolves from monitoring automation (from driver's seat) to simply being a passenger (in any seat)

In Showrooms Now at an Affordable Cost

While automakers race each other to introduce the first versions of full vehicle automation, every major automaker is offering one or more ACA systems on at least one model this year. ACA is becoming such a recognized and broadly available safety feature (known by many different sub-brand names) that the IIHS amended its safety rating methodology last year so that only vehicles that offered a front crash prevention system were eligible for its highest "Top Safety Pick +" rating. In 2014, out of 68 Top Safety Picks, an impressive 43 different models, from the Honda Civic to the Infinity Q70, offered front crash prevention systems (largely as optional equipment) and were awarded Top Safety Pick +. Furthermore, while Volvo has stood alone in making its ACA systems standard equipment on some models since 2010, other automakers are rapidly following suit. Mercedes has made a forward collision prevention system standard on its entry-level CLA-class sedans, and decreasing costs will allow these systems to become standard equipment for models at lower price points in the near future.

Today's average ACA safety package costs about $3,000 to $3,500. Marconi Pacific research indicates this current price is declining at 7 to 9 percent per year, such that by the end of the decade, prices for these ACA system packages will hover around $2,000.

As automakers implement cost savings from high-volume production and improve the software that already enables ACA functionality, an increasing number of vehicles are being manufactured that can respond to imminent crash situations. As these systems roll out in more vehicle models, vehicle crash frequency and severity can be expected to decrease at a rate much faster than the historical average. But how fast, and when will the effects begin to be felt?

FIGURE 4

Example SAV Technology Introductions

A partial list of technology introductions. Industry leaders are debuting sophisticated semi-automated systems that build on existing ACA technology.

Manufacturer	Technology	Introduction Year
Audi	Traffic Jam Assist (slow speed adaptive cruise control with braking and lane centering)	2015
BMW	Traffic Jam Assist Highway Pilot	2013 2015
GM	Super Cruise (full-speed adaptive cruise control with braking and lane centering)	2016
Honda/Acura	Adaptive Cruise Control and Lane Centering	2013
Hyundai	Adaptive Cruise Control and Lane Centering	2014
Mercedes	Traffic Jam Assist plus Adaptive Cruise Control and Lane Centering	2013
Tesla	Freeway autopilot (specific details not released)	2015 (via software update)
Volvo	Traffic Jam Assist	2014
VW	Traffic Jam Assist	2014

Source: Automaker vehicle introductions or announcements

Diffusion Findings

ACA is increasingly available as standard equipment on luxury vehicles and as optional equipment on mass-market vehicles. However, the lag between a new technology becoming available and that technology having a meaningful presence in the overall U.S. vehicle fleet can be long, determined both by the pace of technology introduction and rate of consumer adoption.

Marconi Pacific has modeled a set of scenarios for ACA technology diffusion using well-established patterns of technology adoption and factors specific to this technology and to customers' new-vehicle buying patterns. We have evaluated population growth, vehicle sales, estimated introduction years for increasingly sophisticated generations of ACA technology, component costs, regulation, consumer segments, and other factors.

We forecast that within just over a decade, fully half of all new vehicles sold will be equipped with collision avoidance technology, and nearly one-fifth of the entire U.S. passenger vehicle fleet will be enabled with at least one generation of collision avoidance technology, depending on the scenario.

Going a step further, Marconi Pacific analyzed and developed data on the efficacy of current and the forecast efficacy for future ACA systems to reduce accidents. We applied these findings to the model of technology diffusion. For a given percentage of vehicles on the road with ACA, what does this mean for the number of accidents avoided compared with a baseline of no technology? Simply put, how many crashes will this technology prevent, and by when?

While full automation will still be in its infancy in 2025, we forecast that 10 to 15 percent of total crashes for that year will be avoided specifically due to collision avoidance systems. By 2035, ACA could reduce all crashes by between 35 and 50 percent as compared with a baseline "no ACA" scenario for that year. This ACA effect is in addition to the general decline in accident frequency due to better road planning, driver education, and non-ACA vehicle safety improvements. The exact forecast depends on the scenario chosen and the specific run of the model. Even if claims costs continue to increase at historical rates, decreases of this magnitude will drive a significant reduction in premiums.

Automation Will Disrupt Traditional Market Dynamics

Now let's consider the big innovation area—automated driving. Will uptake be strong? We think so; after all, no other technology feature ever offered on automobiles has allowed drivers to do something different with their eyes and brains! As noted above, ACA is part of any technology package that offers automation. So as semi- and fully automated vehicles (SAV and AV) come along, we will see even more of the core technology that ACA systems are based on present on these vehicles, further reducing crashes.

Vehicles will progress from simply augmenting the driver's own actions in crisis situations to taking over a significant and increasing portion of the driving workload. If you've had the pleasure of driving a late-model BMW or Mercedes with Traffic Jam Assist (TJA), you've driven the early commercial versions of a Semi-Automated Vehicle (SAV). You can cede control of the accelerator, brake, and steering to the car in stop-and-go highway traffic, and the car will keep pace with traffic while making sure you stay in the lane. Drivers using this level of automation must be prepared to take control in short notice; so no movies in the front seat quite yet. The emphasis of these systems is not on crash avoidance, which uses the same technology components

as ACA. Instead, these systems are convenience-oriented, beginning to remove the tedium of driving and eventually freeing up drive time for other activities.

Within about five years, drivers will be able to hand control of a substantial amount of the driving over to the SAVs under a limited but fast-increasing number of driving environments. For example, we will see cars with autopilot that can be turned on once you've merged onto the freeway; within the subsequent three or so years, a more advanced version can be expected that can be turned on earlier and do the merging for you. And we'll see vehicle self-parking at very low speeds in some parking environments, such that you will be able to step out of the vehicle at a garage entrance and instruct the vehicle to find a parking place on its own. Some of these advances in capability may even be retroactively applied to earlier models through over-the-air software updates.

Countervailing Factors

Despite a historical decrease in accidents, the auto insurance industry has managed to grow for over half a century. Three broad trends have supported this steady premium growth, even as the balance of claim frequency and severity has changed drastically.

1. The severity of bodily injury claims has driven a large part of overall premium growth due to the rising cost of medical care. Health care costs have skyrocketed since 1965, with real per capita health expenditures growing at 4.5 percent annually between 1965 and 2010.[5]
2. Property damage claim severity has also seen a drastic increase, bolstering premium growth at a time of decreasing claim frequency. Complex electronics, lightweight construction materials, and comprehensive airbag systems have been added to vehicles, increasing safety and fuel efficiency but decreasing vehicle survivability in the event of an accident. Even when vehicles can technically be repaired, the costs to do so end up rivaling the actual cash value, leading to a total loss claim
3. Population growth and the shift from one-car to two-plus-car households has expanded the number of vehicles on the road even as driving has become safer. Urbanization, car sharing, and alternative transportation networks like Uber are likely to begin slowing the historical trend.

In some scenarios these historical trends continue to drive premium growth. But the downward pressure from ACA technology as it diffuses through the vehicle fleet and delivers decreases in accident frequency and severity will be the greatest determinant of the trajectory of the current $200 billion of industry premium.

Immediate Steps for the Insurance Industry to Take

Technology will continue to disrupt many industries. The examples are multifold: Pagers have succumbed to mobile phones, newspapers to digital content, some high-capital oil projects to lower-cost fracking. In each of these cases the old industry remains—but it is not as robust, and in some cases is a shadow of its former self. Will this be the case for motor insurance?

Vehicle crash avoidance technology—ACA and its many successor generations—will reduce accidents and the consequent risk that premiums are based on. There is some room to debate the timing of the impact, but not too much and certainly not the direction of the change. Technology is the disruptor.

So what might an insurance industry executive begin to do? We believe there are six steps to take now.

1. While full automation is the media fascination, recognize that long before there is significant automation penetration, the frequency and severity of auto accidents will be markedly reduced by ACA systems that are already on the market and their many ACA-equipped successors.
2. Learn about ACA technology and its benefits. Equip yourself and your executive team with ACA-equipped vehicles, and understand how they perform.
3. Understand the timing of introductions of the technology, the adoption by drivers, and the diffusion through the fleet, across the full range of vehicles you insure.
4. Evaluate your own book. Based on IIHS and independent research, there are data to be gleaned on the effectiveness of ACA systems.
5. Develop long-term strategies regarding vehicle automation and the implications for vehicle ownership models, crash liability, insurance needs, and potential new risks.
6. Investigate the blocks of premium that can be built or enhanced from other lines to replace likely premium losses from less motor insurance.

Remember Blackberry? Its co-CEOs were caught flat-footed when the iPhone was introduced. One CEO was worried, the other was sure that touch screens and apps were not the wave of the future. To say they didn't move fast enough is an understatement; Blackberry has lost 95% of its market value from its peak in 2008.

While the absolute impact of vehicle crash avoidance technologies will take time to be felt as the fleet slowly turns over—Blackberry didn't lose its market value overnight—there is little doubt that sensors, processors, and software will work together to save drivers from many common crash situations. While these changes are an unalloyed positive development for society, the insurance industry will nevertheless have to cope with significant disruptions to its traditional business model as premiums decline. A proactive understanding of ACA technology, the timing of its impact on the fleet, and how these changes will reverberate through the insurance and adjacent industries will separate companies that adapt to vehicle innovation from companies that will be left behind. □

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